

March 2, 1880.

Prof. St. George Mivart, F.R.S., Vice-President, in the Chair.

The following papers were read:—

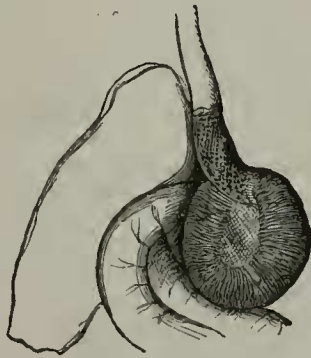
1. Contributions to the Anatomy of Passerine Birds.—Part I.
On the Structure of the Stomach in certain Genera of
Tanagers. By W. A. FORBES, B.A., F.L.S., Scholar of
St. John's College, Cambridge, Prosector to the Society.

[Received February 16, 1880.]

Under this heading I propose to continue from time to time, as material may occur, the "Notes on the Anatomy of Passerine Birds," of which the late Prof. Garrod published four parts in the Society's 'Proceedings' ¹.

In the vast majority of Passerine birds the structure of the anterior part of the alimentary canal conforms to the type present in the Fowl—that is to say, to an œsophagus, which may or may not

Fig. 1.



Stomach of *Tachyphonus melaleucus*, natural size, undisturbed, and viewed from behind. The liver, œsophagus, and small intestine are also partially represented.

be dilated into a crop, succeeds a stomach consisting of two parts:—an anterior glandular part, the *proventriculus*; and a posterior part, separated off from both proventriculus and duodenum by more or less distinct constrictions—the gizzard or *ventriculus*, of which the muscular walls are always more or less thickened, and provided with a central tendon on each side (*vide* fig. 1).

¹ Part I. P. Z. S. 1876, p. 506; Part II. 1877, p. 447; Part III. 1877, p. 523; Part IV. 1878, p. 143.



As was first pointed out by Lund, half a century ago, a singular exception to this rule obtains in the Tanagers of the genus *Euphonia*¹.

From his description (quoted below) and figures, it is quite evident that Lund considered that there was, in these birds, an intermediate zone devoid of glands or muscles, between the proventriculus and the commencement of the small intestine, and that a small lateral diverticulum springing from this zone was also present, representing the true, though rudimentary, gizzard. Lund found, as he believed, this state of things in three species of *Euphonia*, whilst the normal type of stomach existed in sixteen other species of Tanagers which he examined. Lund's description has frequently been copied since in various text-books, and his figures at least three times reproduced².

Mr. Sclater, having called my attention to this subject, I have been able, thanks to the resources of the Prosector's department and to the material afforded by Mr. Salvin, to reexamine this question. I have been able repeatedly to dissect specimens of various species of *Euphonia*, both preserved in spirit and quite fresh. I can fully confirm Lund's description in all points, except as regards the presence of a small lateral diverticulum from the alimentary canal, of which I have never been able to find the slightest trace, though I have always carefully looked for it.

Fig. 2 (p. 145) will show the structure of this part of the alimentary canal, with the parts as little disturbed as possible, but with the stomach &c. cut open from behind, in a perfectly fresh specimen of *Euphonia violacea*. As will be seen, between the glandular proventriculus and the villi-covered duodenum a narrow zone is interposed, with its walls in no degree thickened, but thin and membranous, and of rather greater calibre than the adjacent parts, there being no pyloric constriction. Moreover there is none of that approximation of the cardiac and

¹ In a pamphlet entitled "De genere *Euphones*, præsertim de singulari canalis intestinalis structura in hocce avium genere, autore Dr. Peter Wilhelm Lund," published at Copenhagen in 1829 (31 pages and 1 plate).

This pamphlet being rather scarce, I here give Lund's own words:—

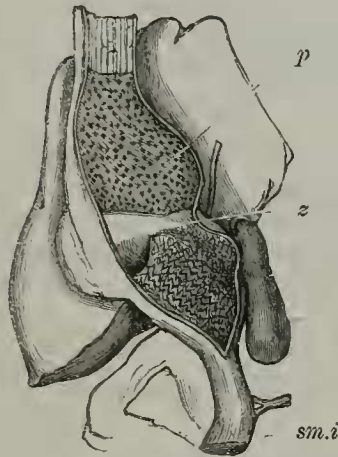
"§ 13 (p. 12). Ubi incipit intestinum tenue, ibi conspicitur in externa superficie angustæ illius zonæ, quæ locum ventriculi occupare videtur, minima quædam protuberantia, cui intus respondet levis quædam impressio. Opaca est parvula hæc protuberantia; quare in parietibus fibras musculosas contineat non dubito; hoc vero, propter minimam ejus molem, decidere vix valebis Ad eam sententiam maxime inclinare animam, ut statuam verum esse hoc ventriculi analogon, haud diffiteor.

"§ 14. Hæc si vera judicetur cogitandi ratio, referas licet structuram hujus avis ad formam avium generalem; ita enim habebimus, uti solet, musculosum nostrum organon e latere intestini exortum, interque proventriculum et intestinum tenue positum; neque a forma generali avium aberrat hæc structura, nisi in eo, quod ad minimum quoddam rudimentum reductus est ventriculus: contra, si zonam illam, de qua mentionem fecimus, angustam pellucidamque, quæ inter proventriculum et intestinum tenue invenitur, analogon esse ventriculi statuamus, constantes duo maximeque essentielles ventriculi avium characteres subruentur, in muscosa structura, ortuque laterali positi."

² Carus and Otto, Tab. Anat. Comp. Illustr. 1835, pt. iv. tab. vi. figs. 4, 5; Wagner, Icones Zool. iii. t. xi. figs. 3, 4; Bruhl, Zoot. aller Thierkl. Lief. iii. pl. ix. fig. 13 a.

pyloric ends of the stomach that obtains in most other birds. There is no trace of any external diverticulum to be seen; and I therefore can only conclude that Lund must have been misled, he, owing to the bad condition of his specimens (a very probable contingency when dissections are made in tropical climates), having mistaken a bit of fat or connective tissue for a diverticulum of the ventriculus, which last there can be no doubt that this non-glandular zone really represents, the muscular walls and hard epithelium of the true Passerine gizzard being almost entirely undeveloped¹.

Fig. 2.

Stomach of *Euphonia violacea*.

A portion of the alimentary canal of *Euphonia violacea*, twice the natural size, cut open and seen from behind, to show the proventriculus (*p*), the narrow zone representing the gizzard (*z*), and the commencement of the small intestine (*sm.i*). The liver and spleen are also seen, as is the end of the cesophagus, which is opened up.

I have also been able to ascertain that the nearly allied genus *Chlorophonia* (at least in *C. viridis*) is characterized by the same non-development of a gizzard. On the other hand, all Tanagers yet examined belonging to other than these two genera have stomachs constructed on the normal type. Thus in a specimen of *Tachyphonus melaleucus* (see fig. 1, p. 143) the characteristic gizzard with the two central tendons is present and well developed, the muscular walls being nearly $\frac{1}{4}$ inch thick, and the epithelium lining it hard and horny. As might have been expected, considerable variations in the comparative development of these parts occur in different genera. Thus in the thick-billed *Pitylus* the whole organ is much more strongly

¹ In confirmation of the above-mentioned view being correct, I may notice that neither Owen (*Anat. Vert.* ii. p. 106) nor Gadow (*Jen. Zeitschr.* B. xiii. p. 168, 1879), when mentioning the stomach of *Euphonia*, describe any lateral diverticulum. Prof. Garrod, in his MS., notes of *Euphonia violacea*, with characteristic terseness, "No stomach specialized, the intestines apparently continuing from the cesophagus."

developed than in the more slender-billed genera *Tanagra*, *Calliste*, &c. Why the genera *Euphonia* and *Chlorophonia* alone, as far as it is yet known, of birds should present this structure is an as yet unsolved problem; I believe they differ in no appreciable degree from other Tanagers in food¹ or habits. I may also remark that in such genera as *Cœreba* and *Æthopyga*, feeding chiefly on minute insects and juices of flowers, there is a well-marked gizzard, with muscular walls and hardened epithelium.

Subjoined is a list of all those species of Tanagers, 27 in number belonging to 11 genera, in which the condition of the stomach is as yet known. This includes the species mentioned by Lund (L.), as well as those examined by the late Prof. Garrod (A. H. G.) and myself, and the nomenclature is that of the 'Nomenclator,' Mr. Sclater having kindly reduced Lund's names to the terms of that list for me.

<i>Tanagers with a normal stomach.</i>	<i>Tanagers with the stomach abnormal.</i>
<i>Calliste tricolor</i> (L. & W. A. F.).	<i>Chlorophonia viridis</i> (W. A. F.).
— <i>festiva</i> (L. & A. H. G.).	<i>Euphonia chlorotica</i> (L.).
— <i>cyaneiventris</i> (L.).	— <i>trinitatis</i> (W. A. F.).
— <i>thoracica</i> (L.).	— <i>violacea</i> (L., A. H. G., & W. A. F.).
— <i>melanonota</i> (L.).	— <i>rufiventris</i> (L.).
— <i>nigriviridis</i> (W. A. F.).	— <i>pectoralis</i> (W. A. F.).
<i>Tanagra episcopus</i> (L.).	
— <i>ornata</i> (L.).	
— <i>abbas</i> (W. A. F.).	
— <i>sayaca</i> (W. A. F. & A. H. G.).	
— <i>palmarum</i> (L. & A. H. G.).	
<i>Rhamphocœlus brasilius</i> (L.).	
— <i>jacapa</i> (W. A. F.).	
<i>Pyrranga erythromelæna</i> (W. A. F.).	
<i>Trichothraupis quadricolor</i> (L.).	
<i>Tachyphonus melaleucus</i> (W. A. F.).	
— <i>cristatus</i> (L.).	
— <i>coronatus</i> (L.).	
<i>Saltator magnus</i> (L.).	
<i>Cissopis leveriana</i> (W. A. F.).	
<i>Pitylus fuliginosus</i> (W. A. F.).	
Two other species not named by Lund.	

Pipridea melanonota is mentioned by Lund (under the name *Tanagra vittata*) as one of the species with a normal stomach. On the other hand, according to M. Taczanowski (P. Z. S. 1879, p. 226), Stolzmann found in this bird "la poche stomacale rudimentaire,"

¹ Several of the wild specimens of *Euphonia* that I have dissected have had in their intestines a large number of small round reddish seeds, which are probably, Mr. Salvin tells me, those of a climbing species of *Ficus* common in the Central-American forests.

and consequently considers that it is nearly allied to the *Euphonia*. It is to be hoped that we shall know ere long which of these statements is correct. It would be also highly desirable to ascertain the structure of the stomach in the other genera placed near to *Euphonia*, particularly that of the genus *Procnias*. I propose on some future occasion to publish a supplementary list describing the condition of the stomach in any other forms that I may have an opportunity of examining.

2. On new and little-known Butterflies from India.

By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received February 17, 1880.]

(Plate XV.)

The following species were collected by Dr. Watt, Professor of Botany in the Calcutta University; some of them I enumerate for the sake of the notes on habits and date of appearance which accompany them, and others because they prove to be new to science.

NYMPHALIDÆ.

SATYRINÆ, Bates.

1. AULOCERA BRAHMINUS.

Satyrus brahminus, Blanchard, Jacquem. Voy. dans l'Inde, iv. Ins. p. 22. n. 18, pl. 2. fig. 4, ♂.

Aulocera werang, Lang, Ent. Month. Mag. iv. p. 247 (1868).

Ravee Basin, up to 6000 feet.

Mr. Moore kindly pointed out to me that the sexes figured by Blanchard are referable to distinct species, the male being the *A. werang* of Lang.

2. HIPPARCHIA DIFFUSA, n. sp.

♀. Closely allied to *H. semele*, from which it principally differs in the obscured and diffused character of the ochraceous patches enclosing the ocelli on the upper surface of the primaries; on the under surface the white belt is well marked, more so than in any specimens of *H. semele* which I have seen. Expanse of wings 2 inches 1 line.

Ravee Basin.

3. EREBIA KALINDA.

Erebia kalinda, Moore, Proc. Zool. Soc. 1865, p. 501. n. 92, pl. 30. fig. 5.

In pine-forests, Ravee Basin, up to 12,000 feet.

4. CALLEREBIA HYBRIDA.

Dr. Watt obtained a series of a *Callerebia* exhibiting intermediate forms between *C. annada* and *C. nirmala*. In the coloration of the